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# Anxiety Disorders, Active Component, U.S. Armed Forces, 2000-2012

Anxiety is a normal reaction to stress; however, in individuals with anxiety disorder, the anxiety becomes chronic and exaggerated, and affects the physical and psychological health of the individual. The main types of anxiety disorders are generalized anxiety disorder, panic disorder, post-traumatic stress disorder (PTSD), phobias, and obsessive-compulsive disorder (OCD). Incident diagnoses of anxiety disorders among active component service members steadily increased from 2000 to 2012. A majority of incident anxiety disorder diagnoses were “non-specific” anxiety disorders (ICD-9-CM codes: 300.0, 300.00, or 300.09) and over 75 percent of service members diagnosed with “non-specific” anxiety disorders did not have a more specific anxiety disorder diagnosis during subsequent medical encounters. Incidence rates of anxiety disorders were highest among females, white, non-Hispanics, in the youngest age groups, and among recruits and junior enlisted service members. About one-third of anxiety disorder cases also had a co-occurring diagnosis of either adjustment or depressive disorder within one year before or after the incident anxiety disorder encounter.

Anxiety disorders are a group of mental disorders characterized by persistent worry, nervousness, uneasiness, apprehension, or fear about future uncertainties. Anxiety is a normal reaction to stress; however, in individuals with anxiety disorder, the anxiety becomes chronic, exaggerated, and uncontrollable. The anxiety may be based on real or imagined events or be of unknown origin and can affect both physical and psychological health. Individuals with anxiety disorders commonly suffer from other mental disorders such as mood disorders (specifically, depression), and sleep disorders such as insomnia.<sup>1-5</sup>

Anxiety disorders are categorized into several diverse types based on their cause or the focus of the anxiety; the main types are generalized anxiety disorder, panic disorder, post-traumatic stress disorder (PTSD), phobias, and obsessive-compulsive disorder (OCD). Individuals with generalized anxiety disorder suffer from chronic worry about a variety of everyday problems; this condition may be harder to diagnose since the cause of anxiety is not related to a specific object, event, or obsession.

Panic disorder is characterized by sudden anxiety attacks whose causes or

triggers are often unclear. An anxiety attack is an episode of intense fear characterized by a sense of impending doom and physical symptoms such as a rapid heart rate, sweating, shortness of breath, and dizziness. Physical symptoms may be so dramatic that affected individuals may fear they are suffering from a heart attack or are dying. Anxiety attacks may be isolated events or may become recurrent; in the latter case an individual may be diagnosed with panic disorder. Chronic anxiety attacks may lead to a fear of having panic attacks in public places and in turn agoraphobia (the fear of certain situations or environments). Because the boundaries and relationships between anxiety attacks, panic disorder, and agoraphobia are unclear, clinical diagnoses and public health surveillance of the conditions are difficult.<sup>6-8</sup>

PTSD results from exposure to a traumatic event such as intense combat, sexual assault, or death of a loved one. Individuals who suffer from PTSD have recurring thoughts and memories of the traumatic event which cause anxiety associated with the event to continue or reoccur. Phobias are irrational and excessive fears of an activity or situation (e.g., fear of heights, flying,

social situations), fear of open environments or crowds (agoraphobia), or fear of objects (e.g., spiders, needles). OCD is characterized by a need to perform a ritual or routine (e.g., excessive hand washing) based on fear or upsetting thoughts (e.g., fear of germs). In all categories of anxiety disorders, the anxiety can become so excessive that it interferes with work, travel, social interactions, and other activities of daily living and disrupts the mental and physical well being of the affected individual.

In the U.S. Armed Forces, mental disorders, of which anxiety disorders are a subset, account for significant morbidity, disability, healthcare service utilization, lost duty time, and attrition from military service.<sup>9-13</sup> Of particular concern in this regard, incidence rates of mental disorders overall and anxiety disorders in particular have increased sharply among U.S. military members during the past 10 years.<sup>9-12</sup> In 2012, anxiety disorders accounted for more medical encounters than any other category of mental disorders and all but three injury/illness categories overall.<sup>12</sup> Furthermore, anxiety disorders affected more military members than all but one other category of mental disorders and accounted for more hospital bed days than all but two other categories of mental disorders.<sup>12</sup>

This report summarizes numbers, rates, and trends of incident diagnoses of anxiety disorders, by type, among members of the active component of the U.S. Armed Forces during the past 13 years. Military and demographic characteristics of those affected with, the healthcare burden associated with evaluation and treatment of, and co-occurring conditions with anxiety disorders are also summarized.

## METHODS

The surveillance period was 1 January 2000 to 31 December 2012. The surveillance population included all U.S. members of the Army, Navy, Air Force, Marine Corps, and Coast Guard who served in the

active component at any time during the surveillance period. Cases were identified from standardized records of hospitalizations and outpatient medical encounters during the surveillance period in fixed (i.e., not deployed, at sea) military and nonmilitary (purchased care) medical facilities.

For surveillance purposes, anxiety disorder cases were ascertained from records of medical encounters that included anxiety disorder-specific diagnoses (ICD-9-CM: 300.0x-300.3).<sup>10,11,13</sup> An incident case of anxiety disorder was defined as a hospitalization with an anxiety disorder-specific diagnosis in the first or second diagnostic position; two outpatient visits within 180 days documented with anxiety disorder-specific diagnoses in the first or second diagnostic positions of the records of the case-defining visits; or a single outpatient visit in a psychiatric or mental health-care specialty setting (defined by Medical Expense and Performance Reporting System [MEPRS] code: BF) with an anxiety disorder-specific diagnosis in the first or second diagnostic position.<sup>10,12</sup>

Anxiety disorders were analyzed overall, by main categories (anxiety states, phobic disorders, and obsessive-compulsive disorders), and by specific diagnoses (as defined by 5-digit ICD-9-CM diagnostic codes) (**Table 1**). An individual could be considered an incident case 1) once during the surveillance period in each subcategory; 2) once during the surveillance period in each main category; and 3) once during the surveillance period for any anxiety disorder-related diagnosis. As such, the sum of incident diagnoses of subcategories and main categories of anxiety disorders exceed the total of incident diagnoses of anxiety disorders of any type. Of note, PTSD diagnoses were not considered in this analysis, because PTSD has been reviewed in detail in other, recent *MSMR* reports.<sup>10,11</sup>

For purposes of this analysis, diagnoses of non-anxiety-related mental disorders or insomnia were considered co-occurring conditions if they 1) satisfied the case definitions for those conditions (as specified in previous *MSMR* reports)<sup>10,11,13,14</sup> and 2) occurred within one year before or after the incident diagnosis of the subject anxiety disorders.

**TABLE 1.** Incident counts and incidence rates of anxiety disorders, overall and by subcategories, active component, U.S. Armed Forces, 2000-2012

Category (ICD-9-CM code)	No.	Rate <sup>a</sup>	% rate difference 2000-2012
Total anxiety disorder <sup>b</sup>	217,409	117.2	327.0
Anxiety states <sup>c</sup> (300.0x)	203,130	109.5	425.2
Anxiety state, unspecified (300.00)	170,652	92.0	644.4
Panic disorder without agoraphobia (300.01)	23,175	12.5	44.2
Generalized anxiety disorder (300.02)	40,659	21.9	174.2
Other anxiety state (300.09)	2,852	1.5	46.3
Phobic disorders <sup>c</sup> (300.2x)	21,675	11.7	32.8
Phobia, unspecified (300.20)	629	0.3	-40.0
Agoraphobia with panic disorder (300.21)	6,811	3.7	57.4
Agoraphobia without mention of panic attacks (300.2)	607	0.3	92.9
Social phobia (300.23)	9,531	5.1	69.7
Other isolated or specific phobias (300.29)	5,624	3.0	-28.7
Obsessive-compulsive disorders <sup>c</sup> (300.3)	8,370	4.5	9.8

<sup>a</sup>Rate per 10,000 person-years

<sup>b</sup>Number of unique individuals overall (i.e., deduplication of all categories).

<sup>c</sup>Number of unique individuals in each main category (i.e., deduplication of subcategories).

## RESULTS

During the 13-year surveillance period there were 217,409 incident diagnoses of anxiety disorders among active component service members (**Table 1**). The unadjusted incidence rate was 117.2 per 10,000 person-years (p-yrs).

For most incident cases (n=205,717, 94.6%), their first anxiety disorder-related diagnosis was a “non-specific anxiety disorder” (i.e., ICD-9-CM: 300.0, 300.00, or 300.09). Many of these individuals later received more specific anxiety-related diagnoses: generalized anxiety disorder (n=29,504, 14.3%); panic disorder without agoraphobia (n=16,789, 8.2%); specified phobic disorders (n=9,234, 4.5%); and obsessive-compulsive disorder (n=3,278, 1.6%) (**data not shown**). Of note, however, more than three-fourths (n=157,549, 76.6%) of those whose incident diagnoses were one of the “non-specific anxiety disorders” did not receive more specific anxiety-related diagnoses during subsequent medical encounters.

### Anxiety states

Of the three main categories of anxiety disorder, “anxiety states” accounted for the most cases (n=203,130) and the highest incidence rate (109.5 per 10,000 p-yrs)

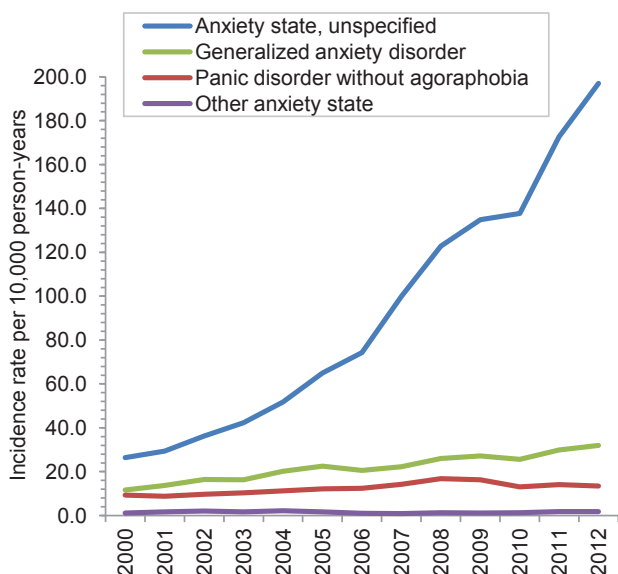
(**Table 1**). Only 2.7 percent of all incident medical encounters for “anxiety states” were hospitalizations (**Table 2**). Members of the Army, recruits, enlisted members, and those in healthcare occupations had markedly higher rates of anxiety state diagnoses than their respective military counterparts. Also, females, service members in their twenties, and white, non-Hispanics, had relatively high rates of anxiety state diagnoses.

Of all specific diagnoses (per ICD-9-CM 5-digit diagnostic codes) included in the anxiety state category, “anxiety state, unspecified” accounted for the most cases (n=170,652), the highest incidence rate (92.0 per 10,000 p-yrs), and the largest percent increase (644.4%) in diagnoses during the surveillance period (**Table 1**, **Figure 1**). Of all other specific anxiety state diagnoses, generalized anxiety disorder accounted for the most cases (n=40,659; rate: 21.9 per 10,000 p-yrs) and the largest relative increase in rates (174.2%) during the surveillance period (**Table 1**, **Figure 1**).

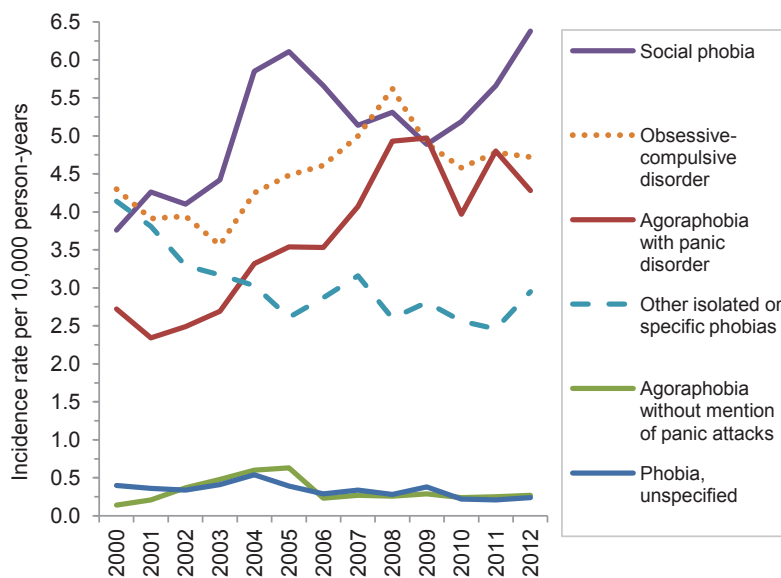
### Phobic disorders

Phobic disorders accounted for 21,675 cases (overall rate: 11.7 per 10,000 p-yrs); 679 (3.1% of the total) incident medical encounters for “phobic disorders” were hospitalizations (**Table 2**). The highest

**FIGURE 1.** Incidence rates of anxiety states, active component, U.S. Armed Forces, 2000-2012



**FIGURE 2.** Incidence rates of phobic disorders and obsessive-compulsive disorder, active component, U.S. Armed Forces, 2000-2012



subgroup-specific rates of phobic disorder diagnoses were among recruits (22.3 per 10,000 p-yrs), females (19.6 per 10,000 p-yrs), and healthcare workers (16.3 per 10,000 p-yrs). Rates of phobic disorder diagnoses were also highest among service members under the age of 20, among white, non-Hispanics, and among service members in the Air Force and among the junior enlisted.

Social phobia was the most frequently diagnosed phobic disorder (n=9,531; rate: 5.1 per 10,000 p-yrs). Social phobia diagnoses increased 69.7 percent during the surveillance period (**Table 1, Figure 2**). Agoraphobia with panic disorder and other isolated/specific phobias each accounted for more than 5,000 cases and affected more than three service members per 10,000 person-years.

### Obsessive-compulsive disorders

Obsessive-compulsive disorder accounted for 8,370 cases and an overall rate of 4.5 per 10,000 p-yrs during the surveillance period (**Table 1**). Annual incidence rates sharply increased from 2003 to 2008 and then slowly declined to a relatively stable level which has persisted from 2010 to 2012 (**Figure 2**). The highest

subgroup-specific rates of obsessive-compulsive disorder diagnoses were among females (8.4 per 10,000 p-yrs), recruits (7.6 per 10,000 p-yrs), and healthcare workers (7.3 per 10,000 p-yrs). Also, service members in the Army and enlisted members (particularly junior enlisted) had higher rates of obsessive-compulsive disorder diagnoses than their respective counterparts in military service.

### Healthcare burdens associated with anxiety disorders

During the 13-year surveillance period, an anxiety disorder was recorded as the primary (first-listed) diagnosis after 1,167,634 medical encounters of 219,972 service members (mean: 5.3 anxiety disorder-related medical encounters per affected individual) (**Figure 3**). Annual numbers of anxiety disorder-related medical encounters and numbers of individuals affected increased 704 percent and 502 percent, respectively, during the period.

During the surveillance period, anxiety disorders accounted for 93,992 hospital bed days; anxiety disorder-related bed days increased 316 percent from the first to the last year of the period (**Figure 3**).

### Co-occurring conditions

Approximately one-third of all service members diagnosed with an anxiety disorder were also diagnosed with an adjustment disorder (34.3%) or a depressive disorder (33.5%) within one year before or after their case-defining anxiety disorder encounters (**data not shown**). Incident diagnoses of anxiety disorders were also temporally associated with diagnoses of behavioral health disorders (ICD-9-CM V-coded diagnoses such as partner relationship problems, family circumstance problems, etc.) (26.8%); “other mental disorder” (19.6%); post-traumatic stress disorder (16.4%); insomnia (12.3%); alcohol abuse/dependence disorder (10.7%); personality disorder (7.1%); and substance abuse/dependence disorder (4.9%).

### EDITORIAL COMMENT

As reported previously,<sup>10,11</sup> diagnoses of anxiety disorders among U.S. military members have steadily increased during the past 13 years. The anxiety disorder-related diagnosis (5-digit ICD-9-CM diagnostic code) that accounts for most of the increase in anxiety disorder-related diagnoses overall is



**TABLE 2.** Incident counts and incidence rates of anxiety disorders, active component, U.S. Armed Forces, 2000-2012

	Total			Anxiety states			Phobic disorders			Obsessive-compulsive disorders		
	No.	Rate <sup>a</sup>	IRR	No.	Rate <sup>a</sup>	IRR	No.	Rate <sup>a</sup>	IRR	No.	Rate <sup>a</sup>	IRR
Total	217,409	117.2	.	203,130	109.5	.	21,675	11.7	.	8,370	4.5	.
Inpatient	6,188	3.3	.	5,546	3.0	.	679	0.4	.	433	0.2	.
Outpatient	211,221	113.8	.	197,584	106.5	.	20,996	11.3	.	7,937	4.3	.
<b>Sex</b>												
Male	164,884	104.0	Ref	154,000	97.1	Ref	16,389	10.3	Ref	6,119	3.9	Ref
Female	52,525	195.0	1.9	49,130	182.4	1.9	5,286	19.6	1.9	2,251	8.4	2.2
<b>Race/ethnicity</b>												
White, non-Hispanic	151,517	130.2	1.7	141,631	121.7	1.7	15,185	13.1	1.8	6,260	5.4	2.3
Black, non-Hispanic	27,367	85.9	1.1	25,442	79.9	1.1	2,785	8.7	1.2	743	2.3	Ref
Hispanic	20,984	110.3	1.5	19,799	104.1	1.5	1,805	9.5	1.3	675	3.6	1.5
Asian/Pacific Islander	5,424	74.8	Ref	5,061	69.8	Ref	539	7.4	Ref	204	2.8	1.2
Other/Unknown	12,117	109.9	1.5	11,197	101.6	1.5	1,361	12.3	1.7	488	4.4	1.9
<b>Age</b>												
<20	14,050	104.0	1.1	12,211	90.4	Ref	1,894	14.0	1.8	541	4.0	1.2
20-24	77,538	126.9	1.3	71,688	117.3	1.3	8,330	13.6	1.7	2,867	4.7	1.4
25-29	53,748	131.6	1.4	50,811	124.4	1.4	5,152	12.6	1.6	2,018	4.9	1.5
30-34	29,577	108.4	1.1	27,997	102.6	1.1	2,718	10.0	1.3	1,282	4.7	1.4
35-39	22,776	98.0	1.0	21,618	93.0	1.0	2,053	8.8	1.1	961	4.1	1.2
40-44	13,625	103.2	1.1	13,045	98.8	1.1	1,032	7.8	1.0	488	3.7	1.1
45+	6,095	96.0	Ref	5,760	90.7	1.0	496	7.8	Ref	213	3.4	Ref
<b>Service</b>												
Army	110,628	166.4	2.0	106,131	159.6	2.2	7,237	10.9	1.3	3,702	5.6	1.6
Navy	37,367	82.8	Ref	33,224	73.6	Ref	5,634	12.5	1.5	1,827	4.1	1.2
Air Force	42,538	95.0	1.1	38,567	86.2	1.2	6,300	14.1	1.7	1,814	4.1	1.2
Marine Corps	21,766	90.5	1.1	20,421	84.9	1.2	1,941	8.1	Ref	833	3.5	Ref
Coast Guard	5,110	99.7	1.2	4,787	93.4	1.3	563	11.0	1.4	194	3.8	1.1
<b>Status</b>												
Recruits	6,818	184.2	1.6	5,910	159.7	1.5	826	22.3	1.9	282	7.6	1.7
Active duty (non-recruits)	210,591	115.8	Ref	197,220	108.5	Ref	20,849	11.5	Ref	8,088	4.5	Ref
<b>Rank</b>												
Junior enlisted	118,771	146.0	2.6	109,649	134.8	2.6	12,682	15.6	3.4	4,355	5.4	1.8
Senior enlisted	80,994	109.8	2.0	77,036	104.4	2.0	7,364	10.0	2.2	3,037	4.1	1.4
Junior officer	10,996	59.3	1.1	10,213	55.1	1.0	1,089	5.9	1.3	617	3.3	1.1
Senior officer	6,648	56.0	Ref	6,232	52.5	Ref	540	4.6	Ref	361	3.0	Ref
<b>Occupation</b>												
Combat-specific <sup>b</sup>	31,994	137.9	1.4	30,863	133.0	1.5	1,795	7.7	Ref	880	3.8	Ref
Armor/motor transport	12,263	152.8	1.5	11,502	143.3	1.6	1,076	13.4	1.7	411	5.1	1.4
Repair/engineering	54,709	100.1	1.0	50,776	92.9	1.0	6,345	11.6	1.5	2,161	4.0	1.0
Comm/intel	49,911	119.3	1.2	46,601	111.4	1.2	5,143	12.3	1.6	2,121	5.1	1.3
Health care	26,046	172.2	1.7	24,484	161.8	1.8	2,469	16.3	2.1	1,101	7.3	1.9
Other	42,486	99.5	Ref	38,904	91.1	Ref	4,847	11.4	1.5	1,696	4.0	1.0

IRR=Incidence rate ratio

<sup>a</sup>Rate per 10,000 person-years<sup>b</sup>Infantry, artillery, combat engineering

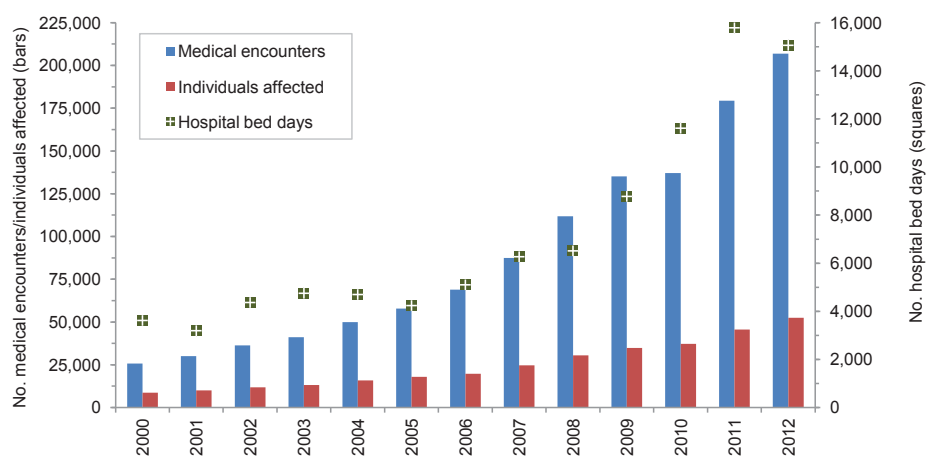
“anxiety state, unspecified” (ICD-9: 300.00). “Anxiety state, unspecified” indicates an anxiety or phobia that does not meet formal criteria for a specific anxiety disorder but whose symptoms are disruptive or distressing to the affected individual.<sup>15-17</sup> The diagnosis is also indicated if, for example, anxiety symptoms have not persisted long enough to be considered generalized

anxiety disorder.<sup>15</sup> For these reasons, the non-specific diagnosis is often the incident (first-ever) reported anxiety disorder-related diagnosis for affected individuals.

Of interest, more than 75 percent of all service members who received “non-specific anxiety disorder”-related diagnoses (ICD-9 codes: 300.0, 300.00, 300.09) did not receive more specific anxiety disorder-related

diagnoses during later medical encounters. The finding suggests that most anxiety disorders among service members lack the clinical hallmarks of more specific anxiety disorders, are eventually attributed to other, commonly co-occurring conditions such as depressive disorders, or are self-limited responses to stresses associated with life events. Other affected individuals may have

**FIGURE 3.** Medical encounters<sup>a</sup> for anxiety disorder, number of individuals affected,<sup>b</sup> and hospital bed days, active component, U.S. Armed Forces, 2000-2012



<sup>a</sup>Total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition).

<sup>b</sup>Individuals with at least one hospitalization or ambulatory visit for the condition.

left military service (and were lost to follow-up) before the full clinical manifestations of specific anxiety disorders were apparent. Nonetheless, some studies have suggested that individuals who do not meet the criteria for formal anxiety disorder diagnoses report similar levels of disability and treatment-seeking as those who are diagnosed with generalized anxiety disorder.<sup>17-20</sup>

Incidence rates of anxiety disorder diagnoses of almost all types increased during the surveillance period. Also, rates of anxiety disorder diagnoses of all types were consistently relatively high among females, white, non-Hispanics, healthcare workers, recruits, and other enlisted members. As with other mental disorders, the physical and mental challenges associated with basic military (recruit) training, the cumulative health effects of continuous exposure of a military force to the stresses of prolonged war fighting, the increased attention to and availability of mental health services, and the decreasing stigma associated with mental healthcare seeking and mental disorder diagnoses have impacted recent trends of diagnoses of anxiety disorders.

This report documents that approximately one-third of service members who were diagnosed with anxiety disorder had co-occurring and roughly concurrent diagnoses of either adjustment or depressive disorder. This observation correlates with findings of other studies that individuals

with anxiety disorders are consistently diagnosed with other types of mental disorders, primarily depression.<sup>1-5</sup> Given the overlap in symptoms with other types of mental disorders and the varying interpretations of the definition of anxiety disorders by clinicians, the counts and rates of anxiety disorder diagnoses reported here must be considered rough estimates of the clinically significant anxiety disorder-related morbidity that affects U.S. military members.

Finally, this report documents that, in addition to increasing rates of diagnoses of anxiety disorders, the overall healthcare burden (e.g., medical encounters, hospital bed days, individuals affected) associated with anxiety disorder evaluation and treatment has also increased dramatically over the past 13 years. Significant increases in resources to identify and treat mental disorders among service members and successes in reducing stigmatization for seeking care for anxiety symptoms likely contribute to such increases. To the extent that such initiatives continue, it is likely that rates of diagnoses of and healthcare burdens associated with treatment of anxiety disorders and other mental disorders will continue to increase.

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## Gastrointestinal Infections, Active Component, U.S. Armed Forces, 2002-2012

Acute gastroenteritis and other infectious disorders of the gastrointestinal system are common in civilian and military populations. During the years 2002 through 2012, there were 286,305 cases of gastrointestinal infection (GI) diagnosed among members of the active component of the U.S. Armed Forces. The distribution of presumed causes of these illnesses (as reported in administrative medical records) was bacterial (29%), viral (68%), and parasitic (3%). Most recorded diagnoses did not specify an etiologic agent. In addition, there were 379,509 other healthcare encounters in which the recorded diagnosis was simply “diarrhea.” During the period, rates of hospitalization for *Clostridium difficile* and “ill-defined intestinal infection” increased greatly. In the outpatient setting, rates of GI diagnoses remained stable or declined, but rates of non-specific “diarrhea” increased steadily. Among reportable infectious causes of GI, rates of both campylobacteriosis and norovirus diagnoses increased steadily since 2009. Among deployed service members with GI during the period 2005 through 2012, viral agents were most often recorded as the underlying etiology (60%). Salmonellosis was the most frequent specific bacterial etiology diagnosed among deployed service members. Countermeasures against GI among service members should be emphasized in military education programs at all levels, during field training exercises, and particularly in deployment settings.

Acute gastroenteritis (AGE) and other infectious disorders of the gastrointestinal system are significant causes of mortality and morbidity worldwide; in the United States, there are an estimated 9.4 million annual medical encounters attributable to foodborne illnesses of presumed known etiology and another 38.4 million episodes attributed to unknown pathogens.<sup>1,2</sup>

In the active component of the U.S. Armed Forces in 2012, diarrheal diseases were responsible for over 17,000 healthcare encounters affecting over 15,000 service members.<sup>3</sup> Despite the implementation of force health protection measures (e.g., provision of clean water, safe food) AGE has continued to be a significant cause of morbidity among deployed military forces.

Outbreaks of AGE characterized by diarrhea, vomiting, fever, malaise or weakness can significantly degrade military operational effectiveness particularly when they affect a large percentage of personnel in deployed units.

AGE can be caused by bacterial, viral or parasitic pathogens. While a significant proportion of these illnesses are foodborne, transmission can also occur through other means (e.g., contaminated water, person-to-person, spread from animal reservoirs, etc.). After laboratory identification of etiologic agents became possible, the dominant pathogens in AGE outbreaks have historically been shown to be bacterial (e.g., *Shigella*, *Salmonella*, *Campylobacter*, *E. coli*). However, viruses are becoming more commonly recognized

as the causative agents in gastroenteritis outbreaks in military operational settings; the most common viruses implicated are noroviruses (NV).<sup>4-8</sup>

Besides acute gastroenteritis, there are other infectious disorders that begin in the gastrointestinal tract but produce symptoms and illnesses not typically associated with diarrhea and vomiting. Examples include typhoid fever, brucellosis, Q fever, hepatitis A, hepatitis E, trichinellosis, and tapeworm infections. The overall category of “gastrointestinal infections” (GI) includes a diverse set of illnesses that, for the most part, share both the portal of entry for the causative agents and the manner of acquisition (food, water, person-to-person, animal contact, etc.). Two infections included in this report that differ from the others in this respect are schistosomiasis and strongyloidiasis.

The purpose of this report is to summarize counts, rates, and temporal trends of diagnoses of GI in active component military members.

### METHODS

The surveillance period was 1 January 2002 to 31 December 2012. The surveillance population consisted of all active component service members of the U.S. Armed Forces who served at any time during the surveillance period. Diagnoses of gastrointestinal infection (GI) were derived from administrative records of all medical encounters of service members in fixed (e.g., not deployed, at sea) medical facilities, reports of notifiable medical events, and records of medical encounters of service members deployed to the Central Command theater of operations (CENTCOM). These records are maintained in the Defense Medical Surveillance System (DMSS) which contains electronic records of all active component military members' hospitalizations and ambulatory



**TABLE 1.** ICD-9-CM codes, major groupings, incident counts and incidence rates of gastrointestinal infections, active component, U.S. Armed Forces 2002-2012

ICD-9-CM	Bacterial agents/conditions	No.	Rate <sup>a</sup>
001.x	Cholera	229	1.5
002.x	Typhoid and paratyphoid fevers	176	1.1
003.x	Salmonellosis	2,735	17.3
004.x	Shigellosis	543	3.4
005.x	Other bacterial food poisoning	12,367	78.5
008.0x	<i>E. coli</i>	535	3.4
008.41	<i>Staphylococcus</i>	82	0.5
008.43	Campylobacteriosis	1,046	6.6
008.47	Other ill-defined gram negative bacteria	25	0.2
009.x	Ill-defined intestinal infection	61,012	387.0
023.x	Brucellosis	297	1.9
027.0	Listeriosis	17	0.1
100.x	Leptospirosis	929	5.9
083.0	Q fever	492	3.1
008.45	<i>C. difficile</i>	2,091	13.3
ICD-9-CM	Viral agents/conditions		
008.61	Rotavirus	249	1.6
008.62	Adenovirus	357	2.3
008.63	Norovirus	529	3.4
008.67	Enterovirus NEC	685	4.3
008.69	Other viral enteritis	18,282	116.0
008.8	Other organism NOS	172,771	1,096.0
070.0	Viral hepatitis A with hepatic coma	49	0.3
070.1	Viral hepatitis A w/o mention of hepatic coma	627	4.0
070.43	Hepatitis E with hepatic coma	4	0.0
070.53	Hepatitis E w/o mention of hepatic coma	52	0.3
ICD-9-CM	Parasitic agents/conditions		
006.x	Amebiasis	497	3.2
007.0	Balantidiasis	385	2.4
007.1	Giardiasis	977	6.2
007.2	Coccidiosis	41	0.3
007.3	Intestinal trichomoniasis	5	0.0
007.4	Cryptosporidiosis	70	0.4
007.5	Cyclosporiasis	9	0.1
007.8	Other specified protozoal intestinal diseases	25	0.2
007.9	Unspecified protozoal intestinal disease	79	0.5
120.x	Schistosomiasis	198	1.3
121.x	Other trematodes	148	0.9
122.x	Echinococcosis	166	1.1
123.x	Other cestodes (tapeworms)	2,192	13.9
124.x	Trichinosis	183	1.2
127.x	Other intestinal helminthiasis (e.g., strongyloidiasis, enterobiasis)	1,815	11.5
128.x	Other and unspecified helminthiasis (e.g., toxocariasis, "worms NOS")	2,003	1.3
129.x	Other unspecified intestinal parasites	210	1.5
136.8	Other specified infectious and parasitic diseases	189	1.2
ICD-9-CM	Non-specific diarrhea		
787.91	Diarrhea	379,509	2,407.5

<sup>a</sup>Rates per 100,000 person-years

visits in U.S. military and civilian (purchased care through the Military Health System) medical facilities worldwide, and in the Theater Medical Data Store (TMDS) which documents medical encounters provided at medical treatment facilities in the CENTCOM operational theater.

Each medical encounter record that included an ICD-9-CM diagnostic code indicative of a GI was used for analyses. For surveillance purposes, an incident case of GI was defined as one inpatient or one outpatient encounter that was documented with an ICD-9-CM code indicative of a GI in the first or second diagnostic position, or a record of a confirmed reportable medical event with a diagnosis of interest in the first diagnostic position. Cases in the deployed setting were summarized separately using data from TMDS and applying the same case definition as described above. An individual could be considered a case of any of the specific categories of GI once every 60 days. The ICD-9-CM codes for the specific GIs of interest are presented in Table 1.

Data from TMDS were unavailable for the entire surveillance period and were summarized from 2005 to 2012.

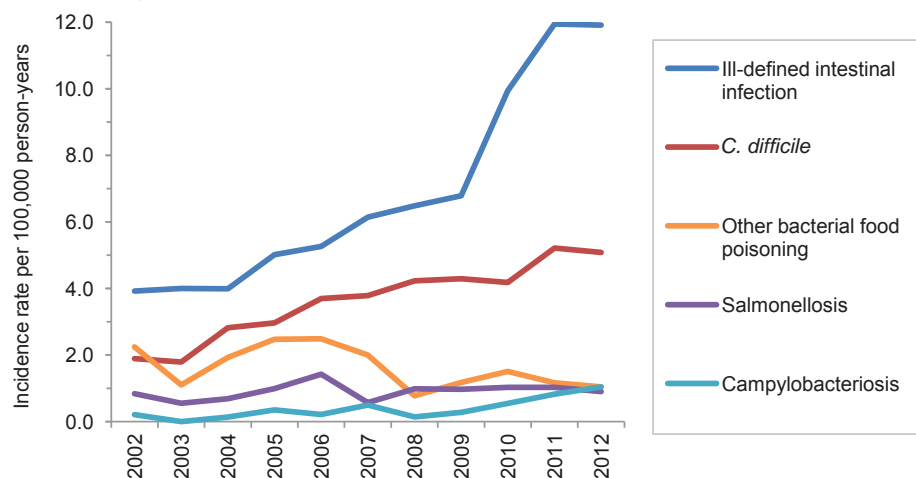
## RESULTS

During the 11-year surveillance period, there were 286,305 cases of GI diagnosed in active component service members. Of all cases, 82,576 (29%) were attributed to bacterial etiologies; 194,329 (68%) were attributed to viral etiologies; and 9,400 (3%) were attributed to parasitic agents. In addition, 379,509 cases of diarrhea were not associated with specific causes (Table 1).

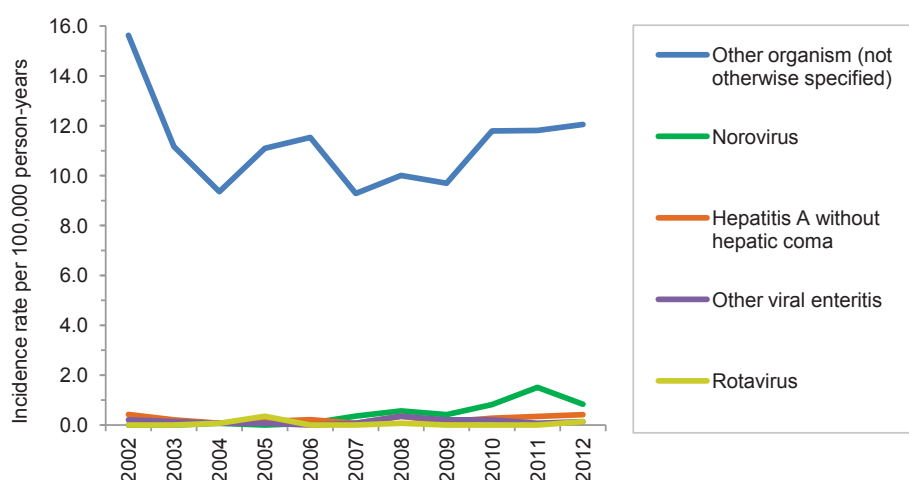
The highest incidence rates for GI were associated with conditions with unspecified, unknown, or ill-defined etiologies. For bacterial-related GIs, the highest overall incidence rate was 387 cases per 100,000 person-years (p-yrs) for "ill-defined intestinal infections," for viral-related GIs the highest incidence rate was for "other viral organisms, not otherwise specified" (1,096 per 100,000 p-yrs); and

**FIGURE 1a-c.** Incidence rates of hospitalizations for gastrointestinal infections identified by major groupings, active component, U.S. Armed Forces, 2002-2012

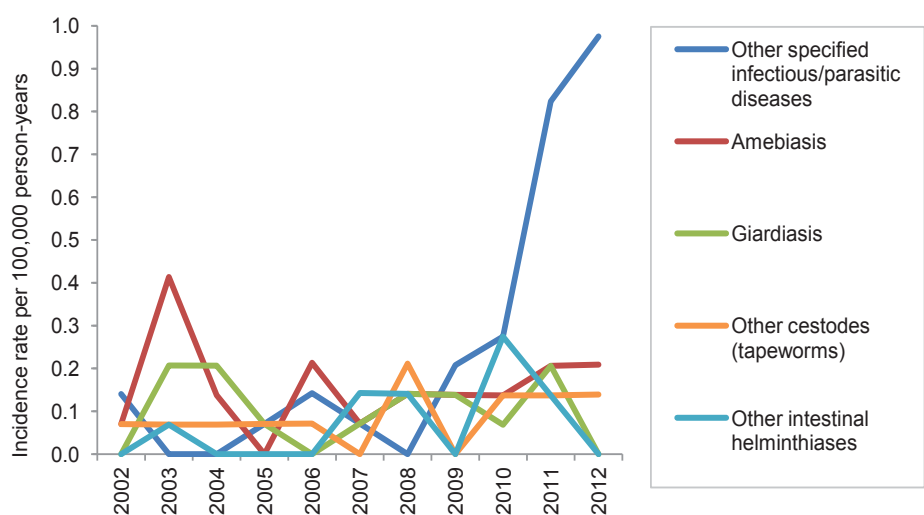
**a. Bacterial agents/conditions**



**b. Viral agents/conditions**



**c. Parasitic agents/conditions**



for parasitic GIs the highest overall incidence rates were seen for “other cestodes” (tapeworms) (13.9 per 100,000 p-yrs) and “other intestinal helminthiases” (other parasitic worms) (11.5 per 100,000 p-yrs).

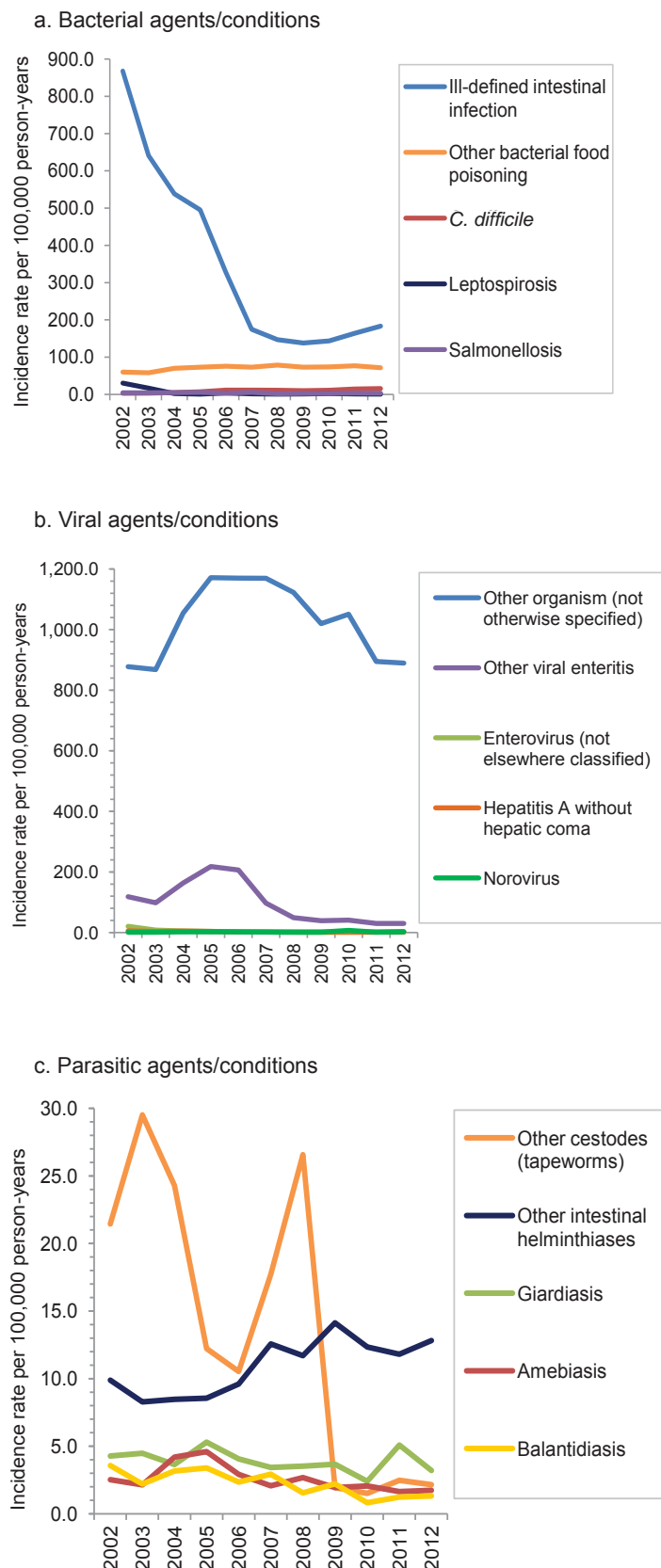
Hospitalizations related to several types of GIs increased during the surveillance period. Consistent with findings of recent reports in U.S. civilian and military populations, hospitalizations attributed to *Clostridium difficile* increased by 78 percent since 2004 (2004: 41 hospitalizations, incidence rate: 2.82 per 100,000 p-yrs.; 2012: 73 hospitalizations, incidence rate: 5.09 per 100,000 p-yrs). The rate in 2012 was only slightly lower than the highest annual rate of the period (2011: 5.22 per 100,000 p-yrs). In addition, since 2009, there were sharp increases in cases of bacterial GIs classified as “ill-defined intestinal infections” (e.g., infectious diarrhea, dysentery) and “other specified infectious and parasitic diseases” (**Figure 1a-c**).

In contrast, GI cases treated in outpatient settings remained stable or declined over the surveillance period. Of note, crude incidence rates of outpatient encounters for bacterial “ill-defined intestinal infections” steeply declined from 2002 to 2007 and then remained relatively low and stable (**Figures 2a-c**). However, incidence rates of outpatient encounters for “non-specific diarrhea” markedly and steadily increased throughout the period (**Figure 3**); more than twice as many cases of “non-specific diarrhea” were documented during outpatient encounters in 2012 (n=44,105 cases) as 2002 (n=19,238 cases) (**data not shown**).

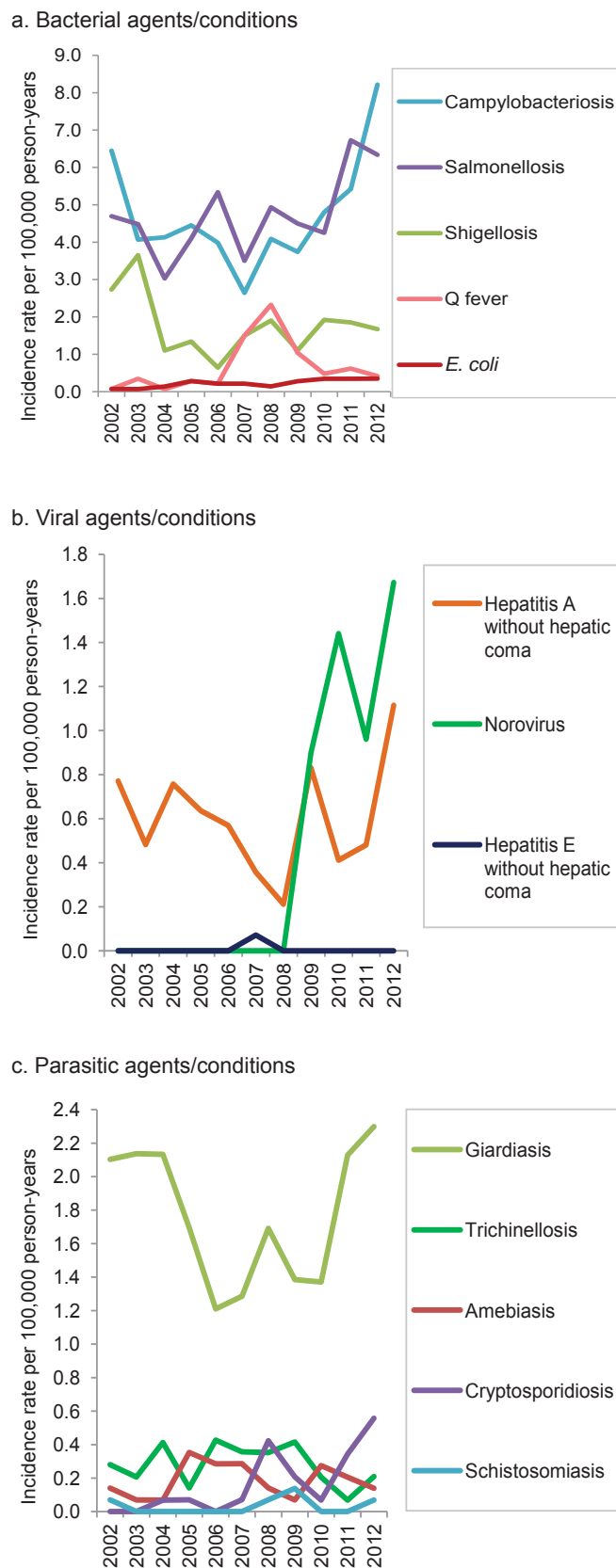
In regard to GI cases reported as notifiable medical events, incidence rates of campylobacteriosis reports increased each year except one from 2007 through 2012; the annual crude rate of campylobacteriosis reports was more than twice as high in 2012 (8.22 per 100,000 p-yrs) as 2009 (3.74 per 100,000 p-yrs). Similarly, reports of cases attributable to norovirus sharply increased each year except one from 2009 (the year that norovirus became a reportable medical event) through 2012 (**Figure 4a-c**).

In the CENTCOM theater of operations, 20,320 cases of GI and 25,938 cases

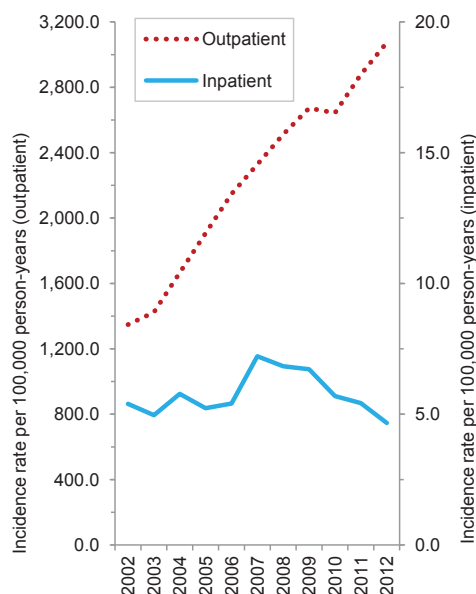
**FIGURE 2a-c.** Incidence rates of ambulatory encounters for gastrointestinal infections identified by major groupings, active component, U.S. Armed Forces, 2002-2012



**FIGURE 4a-c.** Incidence rates of reportable medical events (RMEs) for gastrointestinal infections identified by major groupings, active component, U.S. Armed Forces, 2002-2012



**FIGURE 3.** Incidence rates of “non-specific diarrhea” (ICD-9-CM: 787.91), active component, U.S. Armed Forces, 2002-2012



of non-specific diarrhea were diagnosed between 2005 and 2012 (per the TMDS). Approximately 39 percent (n=7,859) of GI cases diagnosed in the CENTCOM operational area had bacterial etiologies. The most frequently reported bacterial pathogen was *Salmonella* (n=1,241); incidence rates of reported *Salmonella* cases fluctuated substantially from year to year and peaked in 2009 (237.65 cases per 100,000 p-yrs). Almost 60 percent of cases among deployed service members (n=12,186) were attributed to viral agents; the vast majority of such cases had no identified pathogens associated with the diagnoses and were classified as “other viral enteritis” and “other organism, not otherwise specified.” Finally, 275 GI cases among deployed service members were reportedly due to parasites (data not shown).

#### EDITORIAL COMMENT

Over the past eleven years, over 280,000 gastrointestinal illnesses of active component service members were attributed (through diagnoses in administrative medical records) to bacterial, viral,

or parasitic causes. Of note, during the period, there were more cases of gastroenteritis reported without than with attributions of specific etiologies.

Approximately 70 percent of cases with reported etiologies were attributed to viral agents; this percentage is slightly higher than the proportion of GI cases attributed to viral causes among service members deployed in the U.S. Central Command operational theater.

Increases of incidence rates for several conditions mirrored those reported in civilian populations. For example, the Centers for Disease Control and Prevention (CDC) recently reported that *Campylobacter* incidence in 2012 was 14 percent higher than the baseline reference period of 2006-08 and was the highest annual rate since 2000; this report documented a similar increase in *Campylobacter* cases reported as notifiable medical events. In addition, hospitalization rates for *C. difficile* infections have been increasing in both civilian and military populations. A future MSMR will document the U.S. military’s experience with *C. difficile* in more detail.

Deriving estimates of the military operational effects and healthcare burdens of GI and diarrheal diseases is difficult as not all service members seek medical care for their illnesses; additionally, those presenting for care are commonly not evaluated with laboratory testing to identify specific etiologic agents. Furthermore, even when performed, laboratory analyses may fail to detect the enteropathogens of interest (e.g., due to specimen inadequacy, low test sensitivity, inappropriate testing). As such, the estimates in this report of cases and incidence rates of GI overall and those due to specific pathogens are undoubtedly underestimates of the true incidence of these conditions among U.S. military members.

Risk factors for the development of infectious gastroenteritis include time spent off base and local food and water consumption (particularly in developing countries). In addition, recent studies have demonstrated that risk for diarrheal disease is elevated during the beginning of overseas deployments. Measures to

counter risk of GI illnesses among service members should be emphasized in military education programs at all levels, during field training exercises, and particularly prior to and during overseas deployment operations.

Finally, there is a growing evidence that acute gastroenteritis may increase risk of significant chronic health effects (e.g., irritable bowel syndrome, celiac disease).<sup>9</sup> As such, continuous assessments of the causes, incidence rates, and risk factors for acute gastrointestinal illnesses, their military operational effects and healthcare burdens, and their potential long-term effects should be military health surveillance priorities.

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## Update: Cold Weather Injuries, Active and Reserve Components, U.S. Armed Forces, July 2008-June 2013

From July 2012 through June 2013, the number of active and reserve component service members treated for cold injuries (n=479) was the lowest of the last five cold seasons (2008-2013). Over the last five years hypothermia was the most common cold injury among service members in the Marine Corps and Coast Guard, while frostbite was the most common type of cold injury in the other three Services. Consistent with trends from previous cold seasons, service members who were female, less than 20 years old, or of black, non-Hispanic race/ethnicity tended to have higher cold injury rates than their respective counterparts. Among service members overall, Army personnel accounted for the majority (62%) of cold injuries.

Training and deploying in cold conditions or environments present risks of cold injury to members of the Armed Forces. The primary physiologic response to cold exposure is vasoconstriction of superficial blood vessels to reduce blood flow to the body surface in order to retain body heat and preserve core temperature.<sup>1</sup> This decreased blood flow may increase the risk of local cold injury such as frostbite in sub-freezing temperatures or immersion foot from prolonged exposure of the feet to a cold, but non-freezing, wet environment. When the body's heat loss exceeds heat production, a progressive fall of core temperature (hypothermia) is associated with worsening function of internal organs important to survival.<sup>2,3</sup>

Military forces around the world have had to contend with cold injuries throughout recorded history. Over time, technological advances and improvements in clothing and equipment offering protection against exposure to cold have reduced the incidence of cold weather injuries among service members. Examples of such improvements include boots that can be safely worn in temperatures as low as -60°F and lightweight next generation cold weather fabrics with highly insulative and protective qualities.

These advances notwithstanding, hundreds of U.S. service members continue to be affected by cold injuries each year due to prolonged exposure to cold while either in training or during deployment operations.

This report summarizes counts, rates, and correlates of risk of cold injuries among members of active and reserve components of the U.S. Armed Forces during the past five years.

### METHODS

The surveillance period was 1 July 2008 to 30 June 2013. The surveillance population included all individuals who served in an active or reserve component of the U.S. Armed Forces at any time during the surveillance period. For analysis purposes, "cold years" or "cold seasons" were defined by 1 July through 30 June intervals so that complete cold weather seasons could be represented in year-to-year summaries and comparisons.

For this analysis, inpatient, outpatient and reportable medical event records in the Defense Medical Surveillance System (DMSS) and in the Theater Medical Data Store (which maintains records of medical

encounters of service members deployed to southwest Asia/Middle East) were searched to identify all primary (first listed) diagnoses of frostbite (ICD-9-CM codes: 991.0-991.3), immersion foot (ICD-9-CM: 991.4), hypothermia (ICD-9-CM: 991.6), and "other specified/unspecified effects of reduced temperature" (ICD-9-CM: 991.8-991.9). To estimate the number of unique individuals who suffered a cold injury each cold season and to avoid counting follow-up healthcare encounters after single episodes of cold injury, only one cold injury per individual per cold season was included. In summaries of the incidence of the different types of cold injury diagnoses, one of each type of cold injury per individual per cold season was included. If multiple medical encounters for cold injuries occurred on the same day, only one was used for analysis (hospitalizations were prioritized over ambulatory visits).

Annual rates of cold injuries (per 100,000 person-years [p-yrs] of service) were estimated only for the active component because the start and end dates of all active duty service periods of reserve component members were not available.

### RESULTS

#### 2012-2013

From July 2012 through June 2013, 479 members of the active and reserve components had at least one medical encounter with a primary diagnosis of cold injury. This number of affected individuals was the lowest of the last five cold seasons. The 71 members of the reserve component (14.8% of the total) diagnosed with cold weather related injuries equaled the total for the previous cold season, which had been the lowest count in five years (**data not shown**).

During the year, 408 active component members had at least one medical

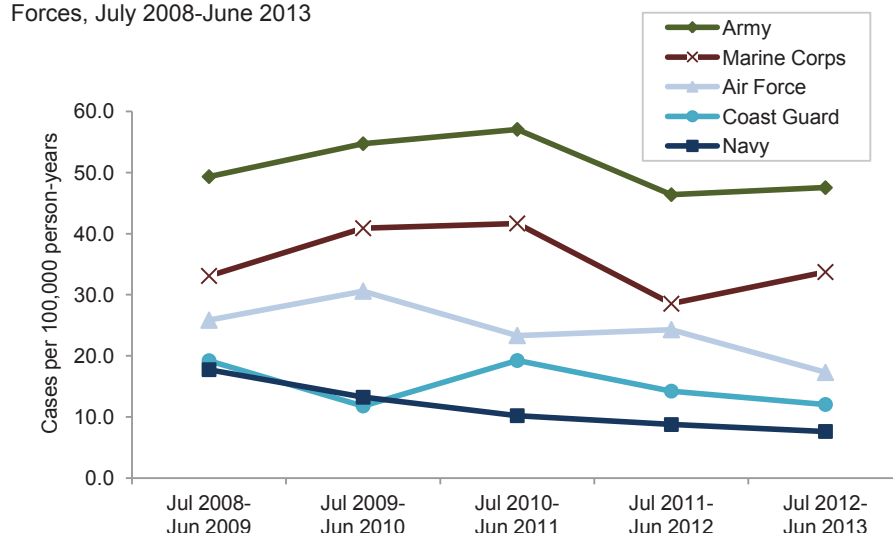
encounter for a cold injury. The overall rate for all services in 2012-2013 (29.6 per 100,000 p-yrs) was the lowest of the last five cold seasons. Rates fell in 2012-2013 from the previous cold season in the Navy, Air Force and Coast Guard but rose slightly in the Army and Marine Corps (**Figure 1**). The number of active component Army service members diagnosed with a cold injury (n=256; rate: 47.5 per 100,000 p-yrs) during the 2012-2013 cold season accounted for 62.7 percent of members affected among all services. The Marine Corps had 66 individuals diagnosed with a cold injury (rate: 33.7 per 100,000 p-yrs); they represented 16.2 percent of all affected service members. Navy service members (n=24) had the lowest rate of cold injuries during the 2012-2013 cold season (rate: 7.6 per 100,000 p-yrs) (**Figure 1**).

The total number of incident events of cold injuries (424 injuries among 408 active component individuals) was the lowest of the last five years for all services combined as well as within each of the individual services with the exception of the Marine Corps. For the Marine Corps, the 70 cold injuries in 2012-2013 was an increase from the five-year low of 57 the year before. Frostbite was by far the most common type of cold injury (n=202 or 47.6% of all cold injuries). Frostbite predominated in the Army (53.8% of injuries) and Air Force (55.0%), but in the other services the proportions of cases of each type of cold injury were similar (**Tables 1a-d**). For all services combined, the 2012-2013 counts by type of cold injury were the lowest in the last five years for frostbite (n=202), hypothermia (n=59), and unspecified (n=86), but the 77 diagnoses of immersion foot represented a 24 percent increase over the five-year low (n=62) from the year before (**Tables 1a-d**).

## 2008-2013

In general, overall rates of cold injuries were higher in females than in males during the five-year surveillance period, particularly for frostbite and "unspecified" cold injuries. Specifically, rates of cold injuries were higher for female than male service members in the Army, Air Force, Marine Corps, and Coast Guard (**Tables 1a-d**). Male

**FIGURE 1.** Rates of cold injury<sup>a</sup> by service and cold year, active component, U.S. Armed Forces, July 2008-June 2013



<sup>a</sup>One cold injury per individual per year

**TABLE 1a.** Cold injuries, active component, U.S. Army, July 2008-June 2013

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	752	27.3	180	6.5	166	6.0	384	13.9	1,482	53.8
Gender										
Male	608	25.5	164	6.9	145	6.1	257	10.8	1,174	49.3
Female	144	38.7	16	4.3	21	5.6	127	34.2	308	82.8
Race/ethnicity										
White, non-Hispanic	344	20.2	116	6.8	102	6.0	161	9.5	723	42.5
Black, non-Hispanic	296	54.1	44	8.0	35	6.4	171	31.2	546	99.7
Other	112	22.1	20	4.0	29	5.7	52	10.3	213	42.1
Age										
<20	74	50.5	21	14.3	22	15.0	49	33.4	166	113.3
20-24	298	36.0	79	9.5	84	10.1	145	17.5	606	73.2
25-29	191	27.7	37	5.4	28	4.1	86	12.5	342	49.6
30-34	72	16.5	24	5.5	19	4.4	48	11.0	163	37.4
35-39	57	17.1	12	3.6	4	1.2	29	8.7	102	30.6
40-44	40	19.0	5	2.4	7	3.3	18	8.6	70	33.3
45+	20	17.9	2	1.8	2	1.8	9	8.0	33	29.5
Rank										
Enlisted	687	30.1	161	7.1	153	6.7	344	15.1	1,345	58.9
Officer	65	13.8	19	4.0	13	2.8	40	8.5	137	29.0
Occupation										
Combat-specific <sup>c</sup>	266	40.5	75	11.4	67	10.2	74	11.3	482	73.4
Armor/motor transport	34	23.6	7	4.8	7	4.8	17	11.8	65	45.0
Repair/engineering	107	18.8	31	5.4	37	6.5	71	12.5	246	43.2
Comm/intel	183	27.9	34	5.2	24	3.7	109	16.6	350	53.3
Health care	57	21.6	4	1.5	11	4.2	45	17.0	117	44.3
Other	105	22.7	29	6.3	20	4.3	68	14.7	222	47.9
Cold year (Jul-Jun)										
2008-2009	139	25.7	38	7.0	27	5.0	78	14.4	282	52.1
2009-2010	150	27.2	44	8.0	37	6.7	95	17.2	326	59.1
2010-2011	176	31.2	31	5.5	43	7.6	88	15.6	338	59.9
2011-2012	145	26.0	24	4.3	31	5.6	72	12.9	272	48.7
2012-2013	142	26.4	43	8.0	28	5.2	51	9.5	264	49.0

<sup>a</sup>Rate per 100,000 person-years

<sup>b</sup>One of each type of cold injury per individual per year

<sup>c</sup>Infantry, artillery, combat engineering

**TABLE 1b.** Cold injuries, active component, U.S. Navy, July 2008-June 2013

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	68	4.2	52	3.2	46	2.9	24	1.5	190	11.8
<b>Gender</b>										
Male	52	3.9	47	3.5	41	3.0	20	1.5	160	11.9
Female	16	6.2	5	1.9	5	1.9	4	1.6	30	11.7
<b>Race/ethnicity</b>										
White, non-Hispanic	37	4.4	30	3.6	24	2.9	8	1.0	99	11.8
Black, non-Hispanic	18	7.1	3	1.2	9	3.5	11	4.3	41	16.1
Other	13	2.5	19	3.7	13	2.5	5	1.0	50	9.8
<b>Age group</b>										
<20	5	6.0	12	14.4	4	4.8	2	2.4	23	27.6
20-24	27	5.3	26	5.1	26	5.1	10	1.9	89	17.3
25-29	17	4.3	6	1.5	13	3.3	2	0.5	38	9.7
30-34	7	2.8	6	2.4	2	0.8	4	1.6	19	7.6
35-39	4	2.0	1	0.5	0	0.0	2	1.0	7	3.5
40-44	6	5.5	1	0.9	0	0.0	4	3.7	11	10.1
45+	2	3.1	0	0.0	1	1.6	0	0.0	3	4.7
<b>Rank</b>										
Enlisted	57	4.2	49	3.6	43	3.2	21	1.6	170	12.6
Officer	11	4.2	3	1.1	3	1.1	3	1.1	20	7.6
<b>Occupation</b>										
Combat-specific <sup>c</sup>	3	2.6	3	2.6	7	6.0	1	0.9	14	12.0
Armor/motor transport <sup>d</sup>	3	5.3	5	8.9	7	12.4	1	1.8	16	28.4
Repair/engineering	13	2.0	19	2.9	17	2.6	9	1.4	58	8.9
Comm/intel	9	3.2	5	1.8	4	1.4	2	0.7	20	7.0
Health care	7	4.0	2	1.2	3	1.7	4	2.3	16	9.3
Other	33	10.3	18	5.6	8	2.5	7	2.2	66	20.5
<b>Cold year (Jul-Jun)</b>										
2008-2009	26	8.0	17	5.2	11	3.4	5	1.5	59	18.1
2009-2010	11	3.4	13	4.0	12	3.7	8	2.5	44	13.6
2010-2011	14	4.3	6	1.9	11	3.4	3	0.9	34	10.5
2011-2012	10	3.1	9	2.8	5	1.6	4	1.3	28	8.8
2012-2013	7	2.2	7	2.2	7	2.2	4	1.3	25	8.0

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year<sup>c</sup>Infantry, artillery, combat engineering<sup>d</sup>Includes boatswains

sailors had slightly higher overall rates of cold injuries compared to their female counterparts. The Army had the most striking rate difference between female (rate: 82.8 per 100,000 p-yrs) and male (rate: 49.3 per 100,000 p-yrs) service members. In the other services, the rate differences by gender were modest. Male service members generally had higher rates of immersion foot and hypothermia (**Tables 1a-d**).

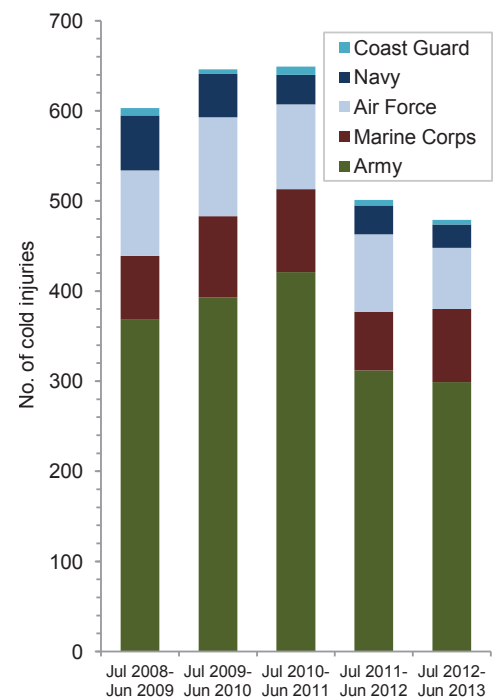
In every service overall rates of cold injuries were higher among black, non-Hispanic servicemen than among other racial/ethnic group members. In particular, within the Army and Marine Corps, rates of cold injuries were over twice as high in black, non-Hispanic service members as in

white, non-Hispanic or “other” racial/ethnic groups (**Tables 1a-d**). Moreover, black, non-Hispanic service members had at least twice the rate of cold injuries as the other racial/ethnic groups in every military occupational category except recruits and trainees, general officers and executives, and administrators during the 2008 to 2013 period (**data not shown**).

Rates of cold injuries were generally higher among the youngest aged (<20 years old) and enlisted members relative to their respective counterparts. However, officers in the Marine Corps and Coast Guard had higher overall rates of cold injuries than enlisted service members (**Tables 1a-d**). In the Army and Air Force, rates were highest

among service members in combat-specific occupations (**Tables 1a, 1c**), specifically those in the general infantry and general law enforcement occupational categories, respectively (**data not shown**). In the Navy, Marine Corps, Air Force, and Coast Guard, service members with an occupation classified as “general, not occupationally qualified” had the highest counts of cold injuries during the surveillance period (**data not shown**). These individuals are typically in training status.

During the five-year surveillance period, there were 2,878 active and reserve component service members affected by any cold injury. Of these, 499 were reservists and 2,379 were active component service members. Of all reservists who suffered a cold injury during the five-year surveillance period, 78 percent (n=387) were members of the Army (**data not shown**). Overall, soldiers accounted for the majority of all cold injuries affecting active and reserve component service members (**Figure 2**).

**FIGURE 2.** Cold injuries<sup>a</sup> by cold year and service, active and reserve components, U.S. Armed Forces, July 2008-June 2013<sup>a</sup>One cold injury per individual per year

**TABLE 1c. Cold injuries, active component, U.S. Air Force, July 2008-June 2013**

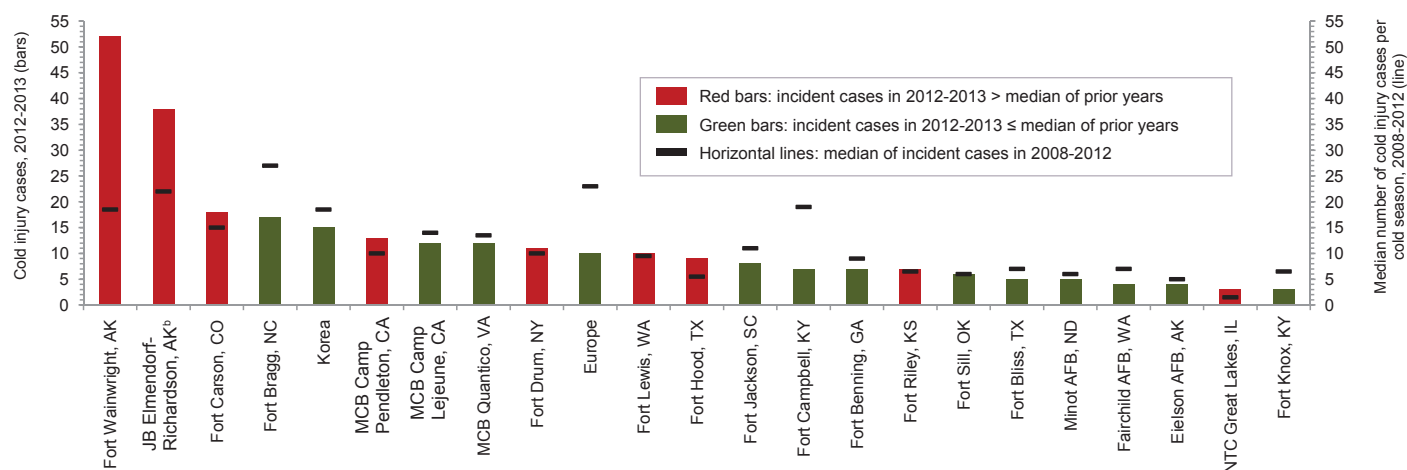
	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	209	12.7	64	3.9	59	3.6	74	4.5	406	24.7
<b>Gender</b>										
Male	172	13.0	55	4.1	49	3.7	50	3.8	326	24.6
Female	37	11.7	9	2.9	10	3.2	24	7.6	80	25.3
<b>Race/ethnicity</b>										
White, non-Hispanic	124	10.7	54	4.7	41	3.5	47	4.1	266	22.9
Black, non-Hispanic	48	20.7	6	2.6	13	5.6	20	8.6	87	37.6
Other	37	14.7	4	1.6	5	2.0	7	2.8	53	21.0
<b>Age</b>										
<20	17	23.4	11	15.1	5	6.9	11	15.1	44	60.6
20-24	109	23.4	29	6.2	24	5.1	32	6.9	194	41.6
25-29	47	11.2	11	2.6	16	3.8	13	3.1	87	20.8
30-34	16	5.8	3	1.1	5	1.8	8	2.9	32	11.7
35-39	11	5.1	4	1.9	5	2.3	4	1.9	24	11.2
40-44	7	5.2	6	4.4	2	1.5	3	2.2	18	13.3
45+	2	3.2	0	0.0	2	3.2	3	4.8	7	11.2
<b>Rank</b>										
Enlisted	185	14.0	60	4.6	50	3.8	67	5.1	362	27.5
Officer	24	7.4	4	1.2	9	2.8	7	2.1	44	13.5
<b>Occupation</b>										
Combat-specific <sup>c</sup>	5	51.1	3	30.6	0	0.0	1	10.2	9	91.9
Armor/motor transport	0	0.0	0	0.0	1	8.0	0	0.0	1	8.0
Repair/engineering	74	13.9	22	4.1	17	3.2	19	3.6	132	24.7
Comm/intel	39	10.2	6	1.6	13	3.4	15	3.9	73	19.0
Health care	12	7.6	1	0.6	4	2.5	4	2.5	21	13.3
Other	79	14.4	32	5.9	24	4.4	35	6.4	170	31.1
<b>Cold year (Jul-Jun)</b>										
2008-2009	35	10.8	17	5.2	14	4.3	19	5.8	85	26.2
2009-2010	48	14.5	17	5.2	12	3.6	24	7.3	101	30.6
2010-2011	47	14.2	12	3.6	10	3.0	10	3.0	79	24.0
2011-2012	46	14.0	10	3.0	14	4.3	11	3.3	81	24.6
2012-2013	33	10.0	8	2.4	9	2.7	10	3.0	60	18.2

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year<sup>c</sup>Infantry, artillery, combat engineering

Of all active component service members who were diagnosed with a cold injury, 56 (2.4% of the total) were affected during basic training. Marine Corps recruits accounted for relatively more of the total cold injuries of their service (5.1% of all cold injuries during the period) than did recruits of the other services (Army, 2.2%; Navy, 2.2%; Air Force, 0.8%) (**data not shown**). Additionally, during the period 54 (2.3%) of the 2,379 active component service members affected with cold injuries were hospitalized. Most (83%) of the hospitalized cases were members of the Army (n=34) or Marine Corps (n=11) (**data not shown**).

### Cold injuries in Iraq and Afghanistan

During the five-year surveillance period, 288 cold injuries were diagnosed and treated in a major theater of operations (i.e., Iraq and Afghanistan). Of these, nearly half (n=143, 49.7%) were frostbite; 68 (24%) were immersion foot; 34 (12%) were hypothermia; and 43 (15%) were “unspecified” cold injuries. Cold injuries in deployed service members most often occurred in those who were male (n=252; 88%), white, non-Hispanic (n=170; 59%), aged 20-24 (n=140; 49%), in the Army (n=217; 75%), enlisted grade (n=266; 92%), and in combat-specific occupations (n=118; 41%).

**FIGURE 3. Annual numbers of cold injuries,<sup>a</sup> 2012-13 and median number during 2008-13, at locations with the most cold injuries, active and reserve component members, U.S. Armed Forces, July 2008-June 2013**<sup>a</sup>One cold injury per individual per year<sup>b</sup>Median for Joint Base Elmendorf-Richardson is based on two years' worth of data beginning with the 2010-11 cold season (the first cold season the joint base was established)



**TABLE 1d.** Cold injuries, active component, U.S. Marine Corps, July 2008-June 2013

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	99	9.9	96	9.6	118	11.8	52	5.2	365	36.5
<b>Gender</b>										
Male	87	9.3	93	10.0	108	11.6	48	5.1	336	36.0
Female	12	18.0	3	4.5	10	15.0	4	6.0	29	43.4
<b>Race/ethnicity</b>										
White, non-Hispanic	49	7.3	68	10.1	59	8.8	36	5.3	212	31.5
Black, non-Hispanic	31	31.6	8	8.2	25	25.5	11	11.2	75	76.4
Other	19	8.3	20	8.8	34	14.9	5	2.2	78	34.1
<b>Age</b>										
<20	19	15.6	31	25.5	39	32.1	7	5.8	96	78.9
20-24	46	9.9	54	11.6	58	12.5	27	5.8	185	39.7
25-29	20	9.7	8	3.9	14	6.8	13	6.3	55	26.7
30-34	10	10.4	3	3.1	4	4.1	4	4.1	21	21.7
35-39	3	4.6	0	0.0	0	0.0	0	0.0	3	4.6
40-44	0	0.0	0	0.0	3	9.6	0	0.0	3	9.6
45+	1	7.8	0	0.0	0	0.0	1	7.8	2	15.5
<b>Rank</b>										
Enlisted	83	9.3	85	9.5	111	12.4	39	4.4	318	35.6
Officer	16	14.9	11	10.2	7	6.5	13	12.1	47	43.8
<b>Occupation</b>										
Combat-specific <sup>c</sup>	29	13.1	16	7.2	19	8.6	8	3.6	72	32.5
Armor/motor transport	2	3.5	2	3.5	2	3.5	4	7.0	10	17.6
Repair/engineering	7	2.9	8	3.4	6	2.5	6	2.5	27	11.3
Comm/intel	21	9.6	3	1.4	8	3.7	15	6.8	47	21.4
Other	40	15.2	67	25.4	83	31.5	19	7.2	209	79.3
<b>Cold year (Jul-Jun)</b>										
2008-2009	18	9.0	21	10.5	21	10.5	7	3.5	67	33.6
2009-2010	28	13.8	14	6.9	34	16.7	10	4.9	86	42.4
2010-2011	26	12.9	24	11.9	28	13.9	7	3.5	85	42.2
2011-2012	9	4.5	18	9.0	21	10.5	9	4.5	57	28.5
2012-2013	18	9.2	19	9.7	14	7.2	19	9.7	70	35.8

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year<sup>c</sup>Infantry, artillery, combat engineering

## Cold injuries by location

Overall there were 21 locations that reported at least 30 cold injuries during the five-year surveillance period (**data not shown**). During the 2012-2013 cold season two locations, Fort Wainwright and Joint Base Elmendorf/Richardson, both in Alaska, had the highest numbers of incident cold-weather related injuries (n=52 and n=38, respectively) (**Figure 3**). All other locations each had fewer than 20 cases of cold weather related injuries among active and reserve component service members combined during the 2012-2013 cold season (**Figure 3**). Compared to the previous cold season, the numbers of service members affected by cold injuries

during 2012-2013 increased 300 percent at Ft. Wainwright, 58 percent at Joint Base Elmendorf/Richardson, and 50 percent at Fort Carson, CO.

## EDITORIAL COMMENT

This year's update on cold injuries among U.S. Armed Forces service members revealed 2012-2013 patterns of incidence similar to those documented in previous updates. Compared to their counterparts, rates of cold injuries tended to be higher among service members who were the youngest (<20 years old), female, enlisted, and of black, non-Hispanic race/ethnicity. For black, non-Hispanic service

members, increased rates of cold injuries affected all enlisted and most officer occupations. The *MSMR* has previously noted that this latter pattern suggests that other factors such as physiologic differences or previous cold weather experience are possible explanations for increased susceptibility. A review of the literature reveals similar findings. British researchers concluded that young male blacks in the British Army had a 30 times greater risk of developing peripheral cold injury. They were also more severely affected than their white counterparts following similar cold weather exposure.<sup>4</sup> In a separate study examining cases of cold injuries during the 2011-2012 cold season in Afghanistan, Mitchell et al. reported that among those most affected were patients of African descent and those who had probably suffered a previous cold injury.<sup>5</sup>

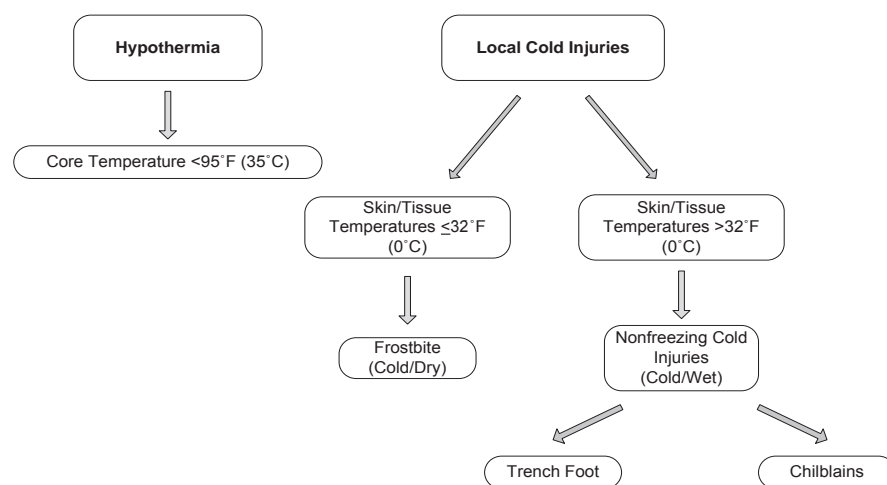
There was a slight decrease in the overall incidence rate of cold injuries among active component members in all services combined during the most recent cold season (2012-2013) despite the slight increases in the rates for the Army and Marine Corps. Within all services, rates of cold weather related injuries have shown some fluctuation over the last five cold seasons. Most notably, there were increases in rates and counts of service members affected by cold injuries during the 2009-2010 and 2010-2011 cold seasons. The 2009-2010 cold season was the coldest in 25 years, while the 2010-2011 winter months in the U.S. were colder on the whole than the long-term average for the U.S.<sup>6</sup>

Over the entire five-year surveillance period, frostbite was the most common specific type of cold injury among affected service members in the Army, Air Force and Navy. Those most affected by frostbite in the Army and Air Force were occupationally involved in combat-specific positions. For sailors, the most affected were Boatswains. Female soldiers and sailors were affected by frostbite at higher rates than their male counterparts. Marines and Coast Guard service members suffered higher rates of injuries from hypothermia than from the other types of cold injuries. Similar to soldiers, Marines engaged in combat-specific occupations had higher rates of diagnoses of hypothermia. In the Coast

**TABLE 2.** Prevention of cold weather injuries

Clothing - remember the acronym <b>C-O-L-D</b>		Carbon monoxide
• Keep it	Clean	• Use only Army approved heaters in sleeping areas.
• Avoid	Overheating	• Never sleep in idling vehicles.
• Wear clothing	Loose and in Layers	• Post a fire guard when using a heater in sleeping areas.
• Keep clothing	Dry	
<b>Eyes</b>		Look after your battle buddy! Inform your unit leader if you notice any of these problems:
• Use sunglasses with side protection in snow-covered areas.		• Skin that is swollen, red, darkened, painful, tender.
<b>Skin</b>		• Body parts that are numb, tingling, bleeding, blistered, swollen, tender, waxy looking.
• Keep your skin clean, covered and dry.		• Uncontrollable shivering, drowsiness, mental slowness, lack of coordination.
• Use gloves to handle all equipment and fuel products.		• Dizziness, weakness, fatigue, blurred vision.
• Avoid cotton clothing - it holds moisture.		• Eyes that are painful, red, watery, or gritty feeling.
• No skin camouflage below 32°F - it obscures detection of cold injuries		• Headache, confusion, dizziness, excessive yawning, cherry red lips and mouth.

Source: U.S. Army Public Health Command; <http://phc.amedd.army.mil>

**FIGURE 4.** Types of cold injuries

Source: Technical Bulletin: Prevention and Management of Cold-Weather Injuries 2005 (TB MED 508)

Guard, those most affected by hypothermia were engaged in “other” occupations.

In the Navy, Air Force, and Coast Guard the rates of cold injuries were lower during the 2012-2013 cold season than in the previous year. The highest numbers of cold injuries were recorded at Fort Wainwright and Joint Base Elmendorf-Richardson, both located in Alaska, and at Fort Carson, CO.

All services of the U.S. military have directives, policies and procedures in place to safeguard service members against cold weather related injuries. It is clear that, even with increased awareness and vigilance

among service members and their chains of command, cold weather related injuries continue to be as relevant in today’s military as in militaries of the past. Although it is doubtful that cold injuries can be completely eliminated, it is nevertheless important for such awareness and vigilance to be maintained or increased. Service members who train in and deploy to areas with wet and freezing conditions should know the signs of cold injury and how to protect themselves against such injuries through use of standard countermeasures, adequate hydration, and avoidance of tobacco, caffeine and vasoconstrictive medications.<sup>7, 8, 9</sup>

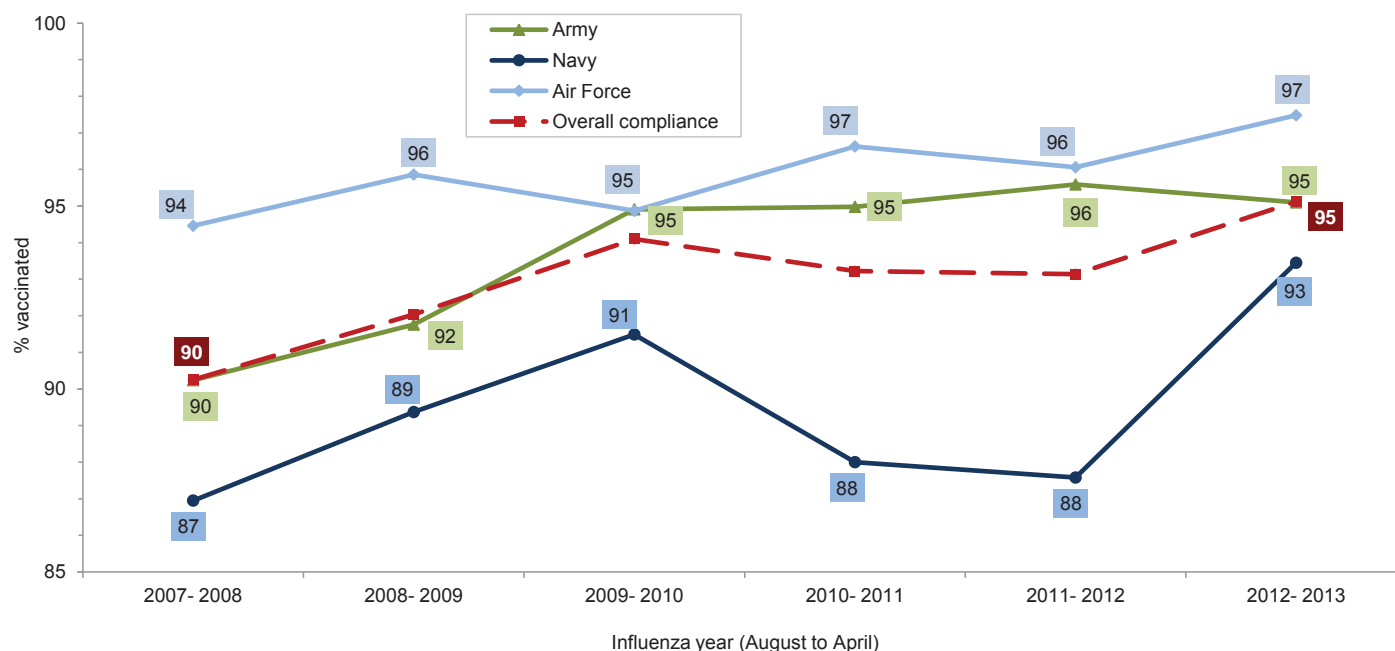
The most current cold injury prevention materials are available online at <http://phc.amedd.army.mil/topics/discond/cip/Pages/default.aspx> (Figure 4, Table 2).

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# Surveillance Snapshot: Influenza Immunization Among Healthcare Workers, Active Component, U.S. Armed Forces, August 2007-April 2013

**FIGURE.** Percentage of healthcare specialists and officers (excluding veterinary) with records of influenza vaccination by influenza year (1 August to 30 April) and service, active component, U.S. Armed Forces, August 2007-April 2013



The United States' Advisory Committee on Immunization Practices recommends that all healthcare personnel be vaccinated against influenza in order to protect themselves and their patients.<sup>1</sup> The Joint Commission's standard on Infection Control emphasizes that individuals infected with influenza virus are contagious to others before any signs or symptoms appear. The Joint Commission requires that healthcare organizations have influenza vaccination programs for practitioners and staff and that they work toward the goal of 90 percent receipt of influenza vaccine. Within the Department of Defense, seasonal influenza immunization is mandatory for all uniformed personnel and for healthcare personnel who provide direct patient care, and is recommended for all others (excluding those who are medically exempt).<sup>2,3</sup>

This snapshot covers a six-year surveillance period (2007 to 2013) and depicts the documented percentage compliance with the influenza immunization requirement among active component healthcare personnel of the Army, Navy and Air Force. During the 2012 to 2013 influenza season, each of the three Services attained greater than 93 percent compliance among healthcare personnel (**Figure**). For all Services together, the compliance level was 95 percent. Overall compliance has increased from 90 percent in 2007-2008 to 95 percent in 2012-2013. The electronic records of the Defense Medical Surveillance System were queried for possible reasons for non-compliance. Identified were relatively small numbers of individuals with medical exemptions and administrative reasons (e.g., separation from the service). Other possible reasons for apparent non-compliance, not documented in this analysis, include inability to record receipt of the vaccine in the electronic health record (e.g., aboard ships, while deployed), and errors in entering the correct code for influenza vaccine.

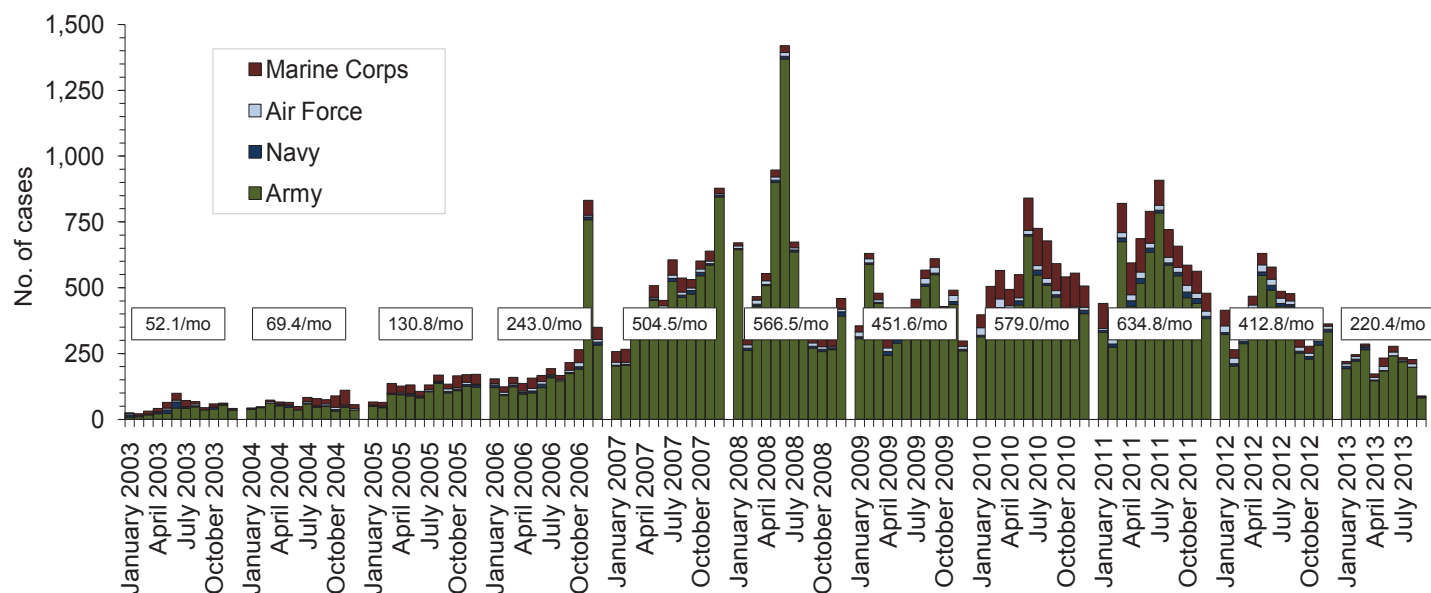
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# Deployment-Related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003-September 2013 (data as of 18 October 2013)

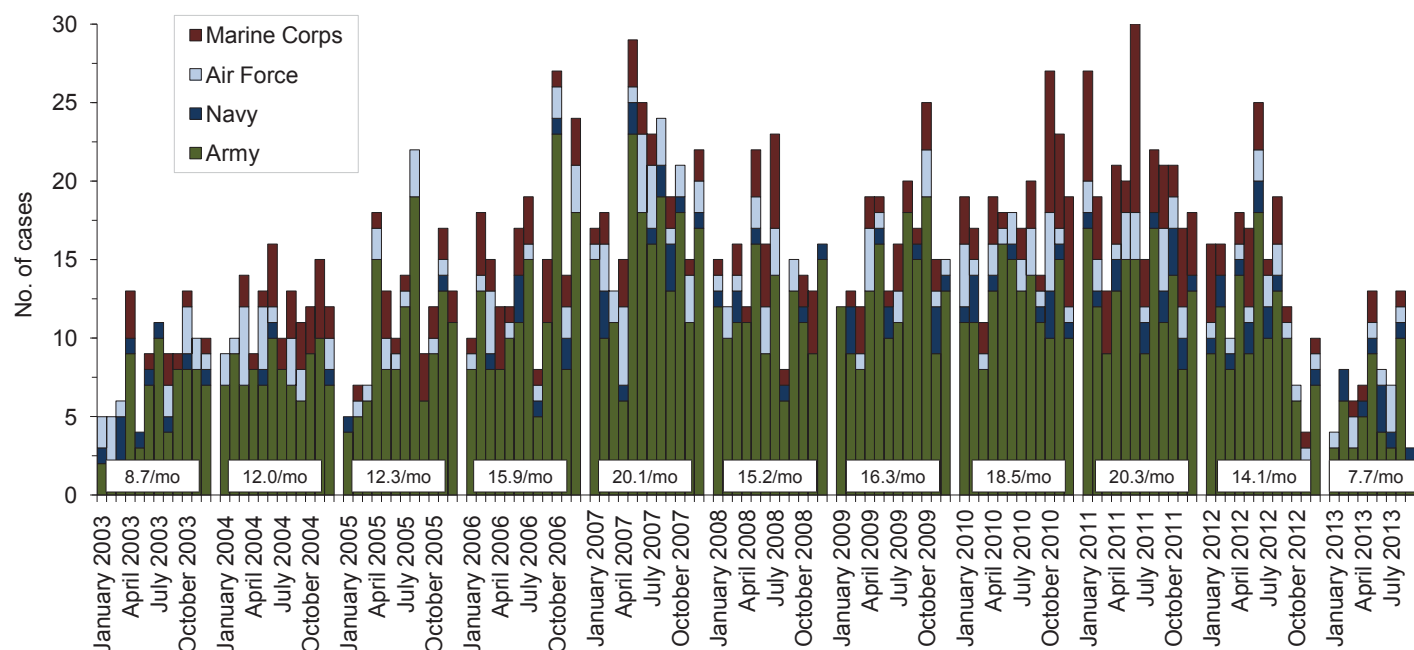
Traumatic brain injury (ICD-9: 310.2, 800-801, 803-804, 850-854, 907.0, 950.1-950.3, 959.01, V15.5\_1-9, V15.5\_A-F, V15.52\_0-9, V15.52\_A-F, V15.59\_1-9, V15.59\_A-F)<sup>a</sup>



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. Dec 2009; 16(12):2-8.

<sup>a</sup>Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from OEF/OIF. (Includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 4,275 deployers who had at least one TBI-related medical encounter any time prior to OEF/OIF).

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 - 453.42 and 453.8)<sup>b</sup>



Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379-83.

<sup>b</sup>One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 90 days of returning from OEF/OIF.



## Medical Surveillance Monthly Report (MSMR)

Armed Forces Health Surveillance Center  
11800 Tech Road, Suite 220 (MCAF-CS)  
Silver Spring, MD 20904

### Director, Armed Forces Health Surveillance Center

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